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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/859,687	05/17/2001	Phillip N. Shea	10991539-1	5739

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EXAMINER	
SINGH, RAMNANDAN P	
ART UNIT	**PAPER NUMBER**
2644	2

DATE MAILED: 09/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/859,687	Applicant(s) SHEA, PHILLIP N.	
	Examiner Dr. Ramnandan Singh	Art Unit 2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 May 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Claim 7 recites a limitation "**step of back-propagating an error**" on page 13, lines 1-2. This is not shown. Further, Claim 11 recites a limitation **"hidden nodes"** on page 13. This limitation is not shown.

Therefore, the "**back-propagation"** and "**hidden nodes"** must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-5, 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahmadi [EP 1093310] in view of Bennett et al [US 5,311,589].

Regarding Claim 1, Ahmadi teaches a method and multi-frequency tone detector,

using a neural network, for detecting a tone such as a DTMF tone in a telephone input signal during a telephone conversation shown in Fig. 1, wherein the tone has a pre-defined frequency profile. The telephone signal is converted to the frequency domain, and then signal features are extracted. Next, these features are inputted to a discriminator for discriminating, if the extracted features correspond to the pre-determined frequency profile, to detect the tone, wherein the discriminator comprises one or more artificial neural networks (ANN) for carrying out the discrimination [Figs. 1, 2; col. 1, line 51 to col. 3, line5]. The neural network is trained to detect the tone, or detect which of many predetermined tones are present [Abstract]. **Preferably, the detector is arranged to detect multi-frequency tones including DTMF tones.** Such tones are commonly found in telephone applications. The discriminator comprises two or more sub-discriminators working in parallel, each for discriminating a subset of frequencies of the tones separately [Figs. 1-6; col. 3, line 22 to col. 4, line 41; col. 8, line 45 to col. 9, line 4; col. 13, line 5 to col. 14, line 58].

Although Ahmadi teaches a tone detector to detect all **single tones and multi-frequency tones** commonly used in telephone applications wherein the multi-frequency tones include DTMF tones [col. 8, line 45 to col. 9, line 4],, he does not disclose explicitly determining call progress tones to determine the state of a telephony call.

Bennett et al teaches expressly detecting DTMF tones as well as call progress tones by determining the amplitudes of pre-selected frequencies in a signal over a

predetermined time period, and determining a candidate tone by selecting two of the pre-selected frequencies with the highest amplitudes and comparing the two selected frequencies to known DTMF and call progress tone frequencies; wherein the DTMF digits are defined by the matrix of Table 1, and the call progress tones are defined by the matrix of Table 2, which are well-known in the art [col. 1 line 49 to col. 2, line 38; Abstract; col. 6, lines 10-20; col. 6, lines 36-59; col. 10, line 52 to col. 11, line 21].

Ahmadi and Bennett et al are analogous art because they are from a similar problem solving area, viz. , Multi-frequency tone detection in a telephone conversation.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the call progress tone characteristics defined in Table 2 of Bennett et al with Ahmadi to enable the neural network to discriminate the call progress tones also.

The suggestion/motivation for doing so would have been to provide more calling features and services at a faster rate, namely, three-way calling, call waiting, redial busy, etc., that require recognizing audible signal tones, such as dual-tone, multi-frequency (DTMF) and call progress tones, which are generated by the network or local switching system [Bennett et al; col. 1, lines 14-29].

Claim 12 is essentially similar to claim 1 and is rejected for the reasons stated above apropos of Claim 1.

Regarding Claims 2 and 13, Ahmadi teaches detecting signaling tones accurately in talk-off, cur-through, or both by maintaining low error rates [col. 1, lines 37-53].

Regarding Claims 3 and 14, the combination of Ahmadi and Bennett et al teaches various states of the call progress providing one or more call options, such as call waiting, busy, etc. [Bennett et al; col. 2, lines 29-38 ; col. 11, lines 11-21 ; col. 13, line 55 to col. 14, line 8].

Regarding Claims 4 and 5, Ahmadi teaches both hardware and software implementations [col. 9, lines 12-20; col. 12, lines 26-37].

Regarding Claims 15 and 16, the limitations are shown above.

4. Claims 6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahmadi [EP 1093310] in view of Bennett et al [US 5,311,589], and further, in view of Li [US 6,549,587 B1].

Regarding Claim 6, Ahmadi teaches a method and multi-frequency tone

detector, using a neural network, for detecting a tone such as a DTMF tone in a telephone input signal during a telephone conversation shown in Fig. 1, wherein the tone has a pre-defined frequency profile. The telephone signal is converted to the frequency domain, and then signal features are extracted. Next, these features are inputted to a discriminator for discriminating, if the extracted features correspond to the pre-determined frequency profile, to detect the tone, wherein the discriminator comprises one or more artificial neural networks (ANN) for carrying out the discrimination [Figs. 1, 2; col. 1, line 51 to col. 3, line5]. The neural network is trained to detect the tone, or detect which of many predetermined tones are present [Abstract]. **Preferably, the detector is arranged to detect multi-frequency tones including DTMF tones.** Such tones are commonly found in telephone applications. The discriminator comprises two or more sub-discriminators working in parallel, each for discriminating a subset of frequencies of the tones separately [Figs. 1-6; col. 3, line 22 to col. 4, line 41; col. 8, line 45 to col. 9, line 4].

Although Ahmadi teaches a tone detector to detect all **single tones and multi-frequency tones** commonly used in telephone applications wherein the multi-frequency tones include DTMF tones [col. 8, line 45 to col. 9, line 4],, he does not disclose explicitly determining call progress tones to determine the state of a telephony call, and training the artificial neural network (ANN) using a telephone network simulator. It is, however, well-known in the art that a telephone network simulator is used to derive design parameters of the telephone system.

Bennett et al teaches expressly detecting DTMF tones as well as call progress tones by determining the amplitudes of pre-selected frequencies in a signal over a predetermined time period, and determining a candidate tone by selecting two of the pre-selected frequencies with the highest amplitudes and comparing the two selected frequencies to known DTMF and call progress tone frequencies; wherein the DTMF digits are defined by the matrix of Table 1, and the call progress tones are defined by the matrix of Table 2, which are well-known in the art [col. 1 line 49 to col. 2, line 38; Abstract; col. 6, lines 10-20; col. 6, lines 36-59; col. 10, line 52 to col. 11, line 21].

Li teaches determining call progress tones [col. 37, lines 34-51], and determining loop filter parameters using a telephone network simulator [col. 67, line 58 to col. 68, line 65].

Ahmadi, Bennett et al and Li are analogous art because they are from a similar problem solving area, viz. , Multi-frequency tone detection in a telephone system.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the call progress tone characteristics defined in Table 2 of Bennett et al with Ahmadi to enable the neural network to discriminate the call progress tones also; and use the telephone network simulator of Li to train the ANN of Ahmad for Fast and accurate operations.

The suggestion/motivation for doing so would have been to provide more calling features and services at a faster rate, namely, three-way calling, call waiting, redial busy, etc., that require recognizing audible signal tones, such as dual-tone, multi-frequency (DTMF) and call progress tones, which are generated by the network or local switching system [Bennett et al; col. 1, lines 14-29], and speed up the network operation using a trained ANN.

Claim 17 is essentially similar to claim 6 and is rejected for the reasons stated above apropos of Claim 6.

5. Claims 7, 9-11, 18, 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ahmadi, Bennett et al and Li as applied to claims 6 and 17 above, and further in view of Moses et al [Us 5,532,950].

Regarding Claim 7, over the combination of Ahmadi, Bennett et al and Li does not teach expressly a back-propagation algorithm to train a neural network. However, the back-propagation algorithm is a very well-known method for training an artificial neural network in the art.; and forms **an integral part** of the neural network system.

Moses et al teaches applying a back-propagation algorithm to train an artificial neural network [col. 7, lines 57-67]. Fig. 5 presents a flowchart describing the steps used in training the neural network 26 [col. 8, lines 27-34].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the back-propagation technique of Moses et al to train the ANN of Ahmadi , and improve performance of the telephone network.

Claim 18 is essentially similar to claim 7 and is rejected for the reasons stated above apropos of Claim 7.

Regarding Claims 9-10, Moses et al teaches training the ANN using a back-propagation algorithm, as outline in Fig. 5, using different sample rates and a learning rate factor [col. 8, line 35 to col. 10, line 21].

Regarding Claims 20-21, the limitations are shown above.

Regarding Claim 11, the hidden nodes are inherent features of an artificial neural network [Ahmadi; Fig. 6; col. 10, lines 45-51]. Further, Moses et al teaches a learning rate factor and hidden nodes 32 [Fig. 3; col. 8, line 35 to col. 10, line 21].
Claim 12 is essentially similar to claim 1 and is rejected for the reasons stated above apropos of Claim 1.

Claim 22 is essentially similar to claim 11 and is rejected for the reasons stated above apropos of Claim 11.

6. Claims 8 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ahmadi, Bennett et al and Li as applied to claims 6 and 17 above, and further in view of Weser et al [US 6,104,803].

Regarding Claim 8, the combination of Ahmadi, Bennett et al and Li does not teach expressly using an Analog Display services Interface (ADSI). However, it may be noted that a standard T1 carrier interface supports an ADSI interface, well-known in the art.

Weser et al teaches a T1 carrier interface 94 that supports an ADSI interface [col. 10, lines 41-45].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the ADSI interface containing call progress tones mixed with audio to train the neural network of Ahmadi, and improve performance of the ANN operating under mixed conditions.

Claim 19 is essentially similar to claim 8 and is rejected for the reasons stated above apropos of Claim 8.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(i) Takahashi et al [US 5,627,941] –Note Abstract and summary.

(ii) Forman [US 6,438,224 B1] – Note Abstract.

(iii) Cole et al [US 5,621,857] - Note Abstract

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Ramnandan Singh whose telephone number is (703)308-6270. The examiner can normally be reached on M-F(8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester Isen can be reached on (703)-305-4386. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)306-0377.

Dr. Ramnandan Singh
Examiner
Art Unit 2644

FORESTER W. ISEN
SUPERVISORY PATENT EXAMINER
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